

Artifact Categorization. Trends and Problems

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Abstract The general question (G) How do we categorize artifacts? can be subject to three different readings: an ontological, an epistemic and a semantic one. According to the *ontological reading*, asking (G) is equivalent to asking in virtue of what properties, if any, a certain artifact is an instance of some artifact kind: (O) What is it for an artifact *a* to belong to kind *K*? According to the *epistemic reading*, when we ask (G) we are investigating what properties of the object we exploit in order to decide whether a certain artifact belongs to a certain kind. (G) thus becomes: (E) How can we know that artifact *a* belongs to kind *K*? Finally, (G) can also be read as a question concerning the semantics of artifact kind terms. The *semantic reading* of (G) is: (S) What kind of reference do artifact kind terms have, if any? In this editorial we expand on the different answers to (O), (E) and (S) that are given in the selected literature on the topic. The result should give us an overall picture of the possible answers to (G).

1 Introduction

Creation of artifacts started relatively early in human evolutionary history, and often proceeded by what we may call “technological bounces”. The first one dates around 12,000 years ago and includes, among other things, the introduction of containers.¹ Much closer to the present, other ones were given by the invention of the heavy plow, and by the three industrial revolutions (that were triggered by steam power, mass production, and information technology respectively). Each of such processes led to a bootstrapping increase in the complexity and diversification of human artifacts. Just

¹More generally, in this period humans started using new materials and techniques, assembling artifacts from smaller parts, and obtaining finer and finer control over the match between the object and its desired function. See e.g. Read and Van der Leeuw (2008) for a hypothesis on the reasons of such technological change.

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to exemplify, after the first industrial revolution, in 1869, over 500 types of hammers were produced in the Birmingham area (Basalla 1988); at the end of three industrial revolutions, 4 years ago, US supermarkets were estimated to contain some 39,000 types of products (FMI 2011).

The result is that we live in a world where not only artifacts, but also kinds, and kinds of kinds of artifacts seem to be countless. To make this vivid, consider something as ordinary and simple as a chair. The variety is overwhelming: along with chairs having four legs, a seat and a back, there are swivel chairs, with only one central leg (and castors), saddle chairs, that don't have backs, and Japanese *zaisu*, without legs. Again, along with "common" chairs, typically used to rest on, swivel chairs make office work easier, wheel-chairs help people move, hanging chairs—sort of hybrids between a chair and a swing—enhance relaxing.

Variety also lies in what people identify as a common or typical chair, as that depends, among other things, on the culture and country of origins (think, for instance, to western dining chairs as opposed to *zaisu* chairs). Dining chairs, swivel chairs, saddle chairs, *zaisu*: the list is very far from being exhaustive.²

Despite this variety, people seldom have doubts regarding how they should categorize a certain artifact. To exploit the chair example a little more, when confronted with items so different as a saddle chair, a glider and a hanging chair, one can infer that people are promptly able both to distinguish and name each of them, and to group them as belonging to the same kind *chair*. In a similar vein, many people are able to distinguish a screwdriver from a voltage tester, even if the two objects may look very much alike.

How is that possible? What pieces of information do we rely on to make such decisions? Are we guided by the form of the object, by its function (in some sense of function), by a combination of these two, or by something else? More generally, how do we categorize artifacts?

2 Artifact Categorization: Three Kinds of Questions

The challenge posed by the issue of artifact categorization has been recently taken up by both psychologists (e.g. Gelman 1988; Bloom 1998; Gelman and Bloom 2000; Malt and Sloman 2007a, b; Kelemen & Carey 2007) and philosophers (e.g. Baker 2007; Dipert 1993; Dennett 1990; Elder 2004; Hilpinen 1992, 1993; Houkes and Vermaas 2010; Preston 2012; Thomasson 2003, 2007; Vaesen and van Amerongen 2008; Wiggins 1980, 2001. For an introduction see Margolis and Laurence 2007; Houkes and Vermaas 2009; Thomasson 2009; Verbeek, and Vermaas 2009).

On the one hand, philosophers tend to argue that we categorize chairs and pens, screwdrivers and mops on the basis of one fundamental property: some think that such fundamental property is the artifact's *function* (e.g. Baker 2007; Kornblith 1980), others the *designer's/creator's intentions* (e.g. Vaesen and van Amerongen 2008), others still a combination of structural properties and function (e.g. Houkes and Vermaas 2010).

² For a glance on chairs variety, see for instance Wikipedia at http://en.wikipedia.org/wiki/List_of_chairs.

On the other hand, the conflicting results of psychological experiments on artifact categorization (e.g. Ahn 1998; Ahn et al. 2001; Gelman 2004; Barsalou et al. 2004; Rips 1989) seem to press either to adopt much more nuanced positions, or to straightforwardly conclude that no coherent account of artifact categorization can be given (Malt and Sloman 2007a, b). A significant exception to these attitudes in the psychological literature is Bloom (Bloom 1996, 1998), for whom we categorize artifacts on the basis of intended category membership.

Before exploring these views in greater detail, however, some preliminary clarifications on the question ‘how do we categorize artifacts?’ are needed. For the sake of convenience, let us isolate this question as the ‘General Question’ (G):

(G) How do we categorize artifacts?

It seems to us that (G) can be subject to three different readings: an ontological, an epistemic and a semantic one. Carefully distinguishing between these readings will serve to understand what would count as a (good) answer to (G).

According to the ontological reading, asking (G) is equivalent to asking in virtue of what properties, if any, a certain artifact is an instance of some kind of artifacts. (G) thus gets specified as the Ontological Question:

(O) What is it for an artifact a to belong to kind K ?³

To illustrate, consider a rocking chair. What is it for this object to belong to the kind *chair* (or to the kind *rocking chair*, depending on the level of specification)? Which are the properties of this object that make it be what it is, i.e. a chair (or, again, a rocking chair)? To put it another way: which properties must be shared by different items—take for instance a dining chair, a saddle chair, and a high chair—in order for them to be all chairs?

According to the *epistemic reading*, when we ask (G) we are asking what properties of the object we exploit in order to decide whether a certain artifact belongs to a certain kind. (G) becomes (E):

(E) How can we know that artifact a belongs to kind K ?

For example, what properties of a voltage tester do we rely on in order to distinguish it from a screwdriver? What pieces of information do we count as relevant to consider different items—e.g. a cuckoo clock, a sundial and a rolling ball clock—as instances of the same kind—in this case, of the kind *clock*?

Finally, (G) can also be read as a question concerning the semantics of artifact kind terms. Indeed, tasks like naming artifacts or applying artifact terms to objects and groups of objects count as types of categorization. We can thus formulate the *semantic reading* of (G) in the following way:

(S) What kind of reference do artifact kind terms have, if any?

As we will see in section 6, much of the debate on the semantics of artifact kind terms focuses on a comparison between the semantic behavior of artifact kind terms and that of natural kind terms. Hence (S) often becomes a question about whether the semantic treatment of natural kind terms can be extended to artifact kind terms as well.

³ We are using the term ‘kind’ in a non-committal manner. See the next section for an overview on the main theories about the metaphysics of artifact kinds.

In the rest of the paper we expand on the different answers to (O), (E) and (S) given in the selected literature on the topic. The result should give us an overall picture of the possible answers to (G).

3 A Background Distinction: Artifacts and Natural Objects

A preliminary remark on artifacts—before considering the standard answers to (O), (E) and (S)—concerns a background distinction (sometimes) taken for granted (in philosophy) between artifacts and natural objects (for an introduction see, specifically, Elder 2004 and Margolis and Laurence 2007).

In the literature on artifacts, it is usually assumed that:

(N) It is possible to divide the domain of concrete objects into natural and artificial ones.

(N) strongly derives from our pre-theoretical idea on the classification of material objects and from a long traditional philosophical insight, that goes back to Aristotle. As R. Hilpinen writes:

“Aristotle makes [...] a distinction between natural objects and artifacts (“artificial products”, *Physica, Book II*, 192 b 28), and describes the latter as products of the art of making things. The art of making something involves intentional agency; thus an artifact may be defined as an object that has been intentionally made for some purpose.” (Hilpinen 2008)

The division between natural objects and artifacts corresponds to the *pre-theoretical* intuition that human beings, wolves, lettuce and gold are entities of a different kind from paintings, novels and tables. These intuitions are well expressed in natural language. Consider, for example, the use of the two terms “chair” and “rock”. We can *prima facie* say (the example is taken from Pustejovsky 1998, p. 329):

- (1) A good chair
- (2) To enjoy the chair

but we cannot say without qualification:

- (3) A good rock
- (4) To enjoy the rock

When it comes to artifacts, we seem to be forced to think about their uses, hence to evaluate them as objects created for a certain use. We seem to be inclined to evaluate natural objects instead only in particular circumstances, as for example:

- (5) That is a good rock to break the window.
- (6) During the day you can enjoy the rock hoping on the James River.

This difference in the evaluation of natural objects and artifacts is probably due to the commonsensical notion of *artifact* at work in the sentences (1–2):

(AD) An artifact is something intentionally produced or modified for a certain use or purpose.

Such a commonsensical notion is based on the analysis of standard cases (e.g. cars, hammers, etc.): standard artifacts are middle-sized, temporally continuous material objects contrasted with natural objects. Notice that this is also true of a dictionary definition of artifacts such as the Webster's one, where an artifact is considered as "A usually simple object (like a tool or ornament) showing human workmanship or modification, as distinguished from a natural object".

Unfortunately, the above sketched pre-theoretic distinction between artifacts and natural objects is unsatisfactory, as it leaves out a wide variety of problematic cases. For example, think of a modified organism: is it an artifact or a natural object? In general, there are many biological or natural objects that are manipulated by humans for specific purposes, and are therefore considered as artifacts and not as natural objects. Just to exemplify, Sperber (2007) mentions seedless grapes, Keil et al. (2007) cite square watermelons.

Two other problematic cases are the main concern of two papers in this special issue. In "Artifact and Tool Categorization" (this issue), S. Dellantonio, C. Mulatti and R. Job test the relationship between the two categories of artifact and tool. They claim that if our pre-theoretical intuition about the distinction between natural objects and artifacts were as neat as it seems to be, we should expect to find some homogeneity in the two categories, respectively. In particular, if one fundamental dimension of the opposition between natural objects and artifacts is that artifacts, but not natural objects, involve the intervention of an *artifex* who assigns them a function, we should expect that tools are categorized as artifacts. However, the experiment they build seems not to support this idea: on the contrary, it points to the conclusion that artifacts and tools are two distinct categories of objects, and that they are not represented in the same manner.

In "Artifact and artifact categorization: comparing humans and capuchin monkeys" (this issue), instead, S. Borgo, N. Spagnoletti, L. Vieu and E. Visalberghi deal with the problem of the extendibility of artifacts characterizations like (AD) above to animals. (AD) in fact only talks about intentional production and modification, and about attribution of functions and purposes, but it is silent on what species can be said to make artifacts in this sense. Is that a human prerogative? On the basis of field experiments with capuchin monkeys in their natural settings, the authors claim that intentional actions of selection and attribution of functions appear to be at play in capuchin tool use.

One final remark will serve well to introduce the next section. As an extension of the distinction between natural objects and artificial objects, artifact kinds are conceived in contrast with natural kinds. In particular, it has been argued that as there are essences for natural objects belonging to natural kinds, so there should be essences for artifacts and artifact kinds, even if these latter are somehow different from natural essences. Philosophers have proposed different theories concerning the essence of artifacts, but a significant part of the discussion has been about whether artifact kinds have a *real* or a *nominal* essence (whereas natural kinds have *real essences*; see e.g. Schwartz 1980). This is for Grandy one of the two main problems of artifact kinds: "it seems that if we believe something like the Kripke–Putnam story about kinds, artifacts lack essences and therefore aren't real kinds" (Grandy 2007, p. 21).

4 Answers to the Ontological Questions (O)

In general, knowing the essence of an artifact kind would be a good way to answer the ontological question:

(O) What is it for an artifact a to belong to kind K ?

In the philosophical literature, artifacts are defined via *intentions*—or author's *intentions*—and *purpose* or *function* (for a survey on the topic of artifact kinds see Franssen, Kroes, Reydon and Vermaas 2013). Briefly put, one could argue that an artifact is the intentional product of an intentional action; someone added that the subject of this intentional action is the author of the object (Hilpinen 1993, pp. 156–157). Baker writes that “Artifacts are objects intentionally made to serve a given purpose” (Baker 2007, p. 49).

The idea that artifacts are objects intentionally made for a certain purpose or function leads, at least, to two general views on artifacts.

The first one is the *functionalist view* (see e.g. Vermaas and Houkes 2006; Vermaas 2008). This view holds that artifacts are functional objects (or that functions are the essence of these objects), and that the function of an artifact determines (or plays a central role in the determination of) what kind of artifact it is. For instance, Hilary Kornblith writes: “For the most part it seems that what makes two artifacts members of the same kind is that they perform the same function” (Kornblith 1980, p. 112).

The second view is the *intentionalist view*. This view emphasizes that artifacts are intentional products. They are created by humans (or by intelligent creatures), hence they are mind-dependent objects. This is what Grandy considers the second philosophical problem of artifacts, i.e. “that artifacts—their existence and their feature—depend on human interests” (Grandy 2007, p. 21).

As regards the role of *function* as an *essential* feature of artifacts, it is important to notice that there are different conceptions of functions, and that they are differently applied to artifacts. Following Carrara and Vermaas (2009), it is possible to distinguish four conceptions of artifact function:

1. *The designer/creator intentions account*, in which the technical functions of an artifact are the capacities or goals for which agents designed the artifact. This a position Philip Kitcher proposed in (1993). In the design view of function one holds that what defines an artifact a as an F is that a is a token of the designed artifact kind F .
2. *The user intentions account*, in which the technical functions of an artifact are the capacities or goals for which agents use the artifact. This so called “use view” holds that what defines an artifact a as an F is that a is being, or could be, used as an F , irrespective of whether a was designed as an F in the first place. This conception of function has been proposed by Neander (1991a, b, 2002) and McLaughlin (2001). Note that if one takes the designer/creator of an artifact as one of its users, the use view may well subsume the designer/creator intentions account. It is a position Dennett, for example, considers when he says that: “The inventor is just another user, only circumstantially and defeasibly privileged in his knowledge of the functions and uses of his device. If others can find better uses for it, his intentions, clearheaded or muddled, are of mere historical interest.” (Dennett 1990, p. 186).

3. *The causal-role account*, in which the functions of an artifact are the capacities by which it causally contributes to the capacities of larger and more complex systems (Cummins 1975). For example, the function a carburetor is the capacity by which it causally contributes to the capacities of a car.
4. *The etiological account*, in which the functions of an artifact are the capacities for which the artifact is reproduced in a long-term sense (Millikan 1984; 1993 and Preston 1998). For example, the function of Aspirin in the twenty century was pain-killing, because pain-killing was the reason why Aspirin was reproduced. Some supporters of the etiological account of functions, in particular Neander (1991b), proposed to include in the etiological characterization of function also the capacities for which artifacts are reproduced in a short-term sense.

Can we consider *functions* as the essences of artifacts? The orthodox position, taken for instance by D. Wiggins in (1980; 2001, pp. 91–95) is to answer this question in a negative way, thus rejecting that functions characterize artifact kinds. This rejection is related to a widely shared Aristotelian anti-realistic conception of artifacts meaning that artifact functions, like any other feature of artifacts, are not candidates for being essences or principles of activity for artifacts (a recent neo-Aristotelian conception of artifacts has been formulated by Van Inwagen 1990).

In Carrara and Vermaas (2009), it has been argued that for each of the above listed accounts of functions (1–4), it is possible to find two artifacts that on one side are clearly the same, because for example they share the same material constitution, but that have, on the other side, different functions.

Take, for example, the *etiological account* (4) (but the same example can be adapted also to the *designer account* (1)). Consider two tablets of Aspirin (the example is taken from Houkes and Vermaas 2004). The first is produced in the first half of the twentieth century and the second is produced in the twenty-first century. In the etiological account, in which artifact functions are the capacities for which artifacts are reproduced, the first tablet has pain-killing as its function. Indeed, at that time, pain-killing was the known capacity of Aspirin. A tablet of Aspirin produced nowadays has both the function of pain-killing and that of blood-clot prevention: this latter, new capacity has been recently discovered and it turned into a second reason for reproducing this drug. Hence the second tablet has pain-killing and prevention of blood clots as its function, meaning that it is of a different functional kind as the first tablet. Yet, the tablets are physically the same.

Whether or not functions are essences for an artifact kind they are nevertheless considered a central issue in artifact characterization. B. Nanay in his “Artifact categorization and the modal theory of artifact function” (this issue) argues that “artifacts are individuated by means of their function”, but rejects “the extra assumption that function is fixed by design”. He thus proposes to replace the design account with what he calls a *modal theory of functions*. Using such a theory “we can accept, with the philosophers, that function individuates artifact categories and we can also accept, with the psychologists, that artifact categorization is sensitive to context and to our pragmatic interests”.

In the *intentionalist view* on artifacts, the focus is on the dependence of artifacts on minds. A champion of this position is Thomasson (2003, 2006, 2007). In her opinion, there are two different conditions that objects of a kind K should satisfy to be

considered as belonging to a real kind. These two conditions are defined through the *Independence Principle* and the *Natural Boundaries Principle*.

According to the Independence Principle, “things of kind K exist independently of the mental, that is, it is possible that there are things that are of the kind K and that there are no mental states whatsoever” (Thomasson 2003, p. 582).

On the other hand, the idea that a kind K has natural boundaries (*Natural Boundaries Principle*) is expressed through two principles: the *Ignorance Principle* and the *Error Principle*. We go back to these principles discussing the semantic approach to artifact kinds.

Together, the Independence Principle and the Natural Boundaries Principle can be considered to express the metaphysical dimension of realism: if something exists and has its nature independently of any mental state, its nature and existence can be completely ignored or misunderstood, even by the entire human race. According to Thomasson artifact kinds are formulated in the following way:

“Necessarily, for all x and all artifactual kinds K , x is a K only if x is the product of a largely successful intention that (Kx), where one intends (Kx) only if one has a substantive concept of the nature of Ks that largely matches that of some group of prior makers of Ks (if there are any) and intends to realize that concept by imposing K -relevant features on the object.” (Thomasson 2003, p. 600)

Artifact kinds definition implies a necessary dependence on the mental. Notice that from Thomasson's point of view it is not sufficient to be the product of intentional actions for an object to be an item of artifact kind K . The object must be the *intended product* of intentional actions. According to the definition proposed by Thomasson, a spoon is a spoon only if its author intended to produce a spoon (and was largely successful in producing it). As we will see in a moment, Thomasson's metaphysical conception of artifacts as necessarily mind-dependent leads to interesting epistemological and semantic consequences (see section 6).

5 Realism and Anti-Realism on Artifact Kinds

As said before, Wiggins' position (Wiggins 1980, 2001) can be seen as the metaphysical received view on artifacts and artifact kinds. It is thus considered one the standard answers to (O).

Starting from the traditional idea that artifacts do not have their own *nature* or *form*—and that therefore there is not a *real principle of unity* for them—it has been argued that artifacts are not real entities (Aristotle 1984; Katayama 1999). On the basis of this anti-realist thesis it has then also been argued that artifact kinds are not *real kinds*.

Briefly put, the traditional argument used by an antirealist on artifact kinds can be summed up in the following way (A):

- (P1) If a kind S is a real kind, then there are viable identity criteria for objects belonging to S .
 (P2) It is not possible to have viable identity criteria for artifacts.

(C) Kinds of artifacts are not-real kinds.

As an example of the application of (A), consider Wiggins' view on natural and artifact kinds: he believes that—following (P1)—natural kinds are *real kinds* because they are associated with identity criteria individuating the essence of the objects via

the determination of certain principles of activity (on identity criteria see Carrara and Giaretta 2001, 2004). Using Wiggins' words, we say that principles of activity are "law-like norms of starting to exist, existing, and ceasing to exist by reference to which questions of identity and persistence can be arbitrated" (Wiggins 2001, p. 83). The determination of natural kinds stands or falls with the existence of those law-like principles. Wiggins specifies the nature of the *principle of activity* with some Aristotelian and Leibnizian passages:

"Things which exist by nature [...] such as animals and the organs of these or plants and the elementary stuff [...] have in them a principle of change or rest (in respect of place or growth and decline or alteration generally) [...] the nature of a thing being the source or cause of non-accidental change or rest." (Aristotle *Physics Book II, Ch. I*)

"[D]ivine law once established [...] has truly conferred upon [things] some created impression which endures within them, or [...] an internal law from which their actions and passions follow [...] if the law of God does in fact leave some vestige of him expressed in things [...] then it must be granted that there is a certain efficacy residing in things, a form of force such as we usually designate by the name of nature, from which the series of phenomena follows." (Leibniz *Gerhardt IV, 1969, 504*)

According to Wiggins, we can think of an activity as a chain of internal and/or external causal interactions. It is a process determining the persistence of the object. So, for example, *life*, or more specifically, the metabolic processes of a human body can be described using law-like sentences.

Wiggins' realism on natural kinds (and organ kinds) is in line with his *antirealism* on artifact kinds (on Wiggins' conception of artifact kinds, see Carrara and Vermaas 2009): artifactual kinds are non-real kinds; the kinds to which artifacts belong are just conventional.

According to Wiggins, *artifact kinds* are *functional kinds*; that is, objects falling under them are individuated on the basis of the functions they are supposed to perform. In other terms:

(FK) An object *o* belongs to a kind *S* iff *o* has the function *F*.

Artifacts are *functionally* characterized: for example, a pen is 'any rigid ink-applying writing implement,' a clock 'any time-keeping device' etc.

But consider this fact: it is part of our way of individuating artifacts that we accept a vast range of possible changes of artifacts—e.g. parts replacement, dismantling, interruption of functioning etc.—leaving the identity of an artifact untouched. Consider for example the case of a clock: in order to fix it we may send it to a watchmaker, who may stop it, open it, and replace its damaged parts. The very same clock starts to function again. Hence one could argue that the principle of functioning is not related to the conditions of persistence for a clock. Moreover, the functional nature of an artifact is insufficient to specify any common properties in relation to objects belonging to the same artifact kind:

"[C]locks, for instance, may be made of a variety of different kinds of material and may function by radically different kinds of mechanisms and are collected

up not by reference to a theoretically hypothesized inner constitution but under functional descriptions that have to be indifferent to specific constitution and particular mode of interaction with environment.” (Wiggins 2001, p. 87)

As a result, the identity criteria we associate with artifact kinds are not clearly determined. They fail to meet logical requirements of *equivalence* and *congruence*: either they are not transitive or they lead to contradictions. This is why objects belonging to artifact kinds are not real substances.

The difficulty in providing necessary and sufficient conditions for belonging to an artifactual kind encourages the adoption of an alternative conception, inspired by the second Wittgenstein. In this perspective an artifact x belongs to an artifactual kind K if and only if x is similar in some relevant respects to paradigmatic instances of K . In his paper “Artefacts and family resemblance” (this issue) P. Garbacz applies the device of family resemblance to artifacts. He considers a frame version of the device and, adopting a conception of artifacts as objects-with-history, provides a new proposal for categorizing artifacts.

Recently, some philosophers have argued against anti-realism on artifact kinds and for a realist view on artifact kinds.

Baker (2004, pp. 99–112) defends the thesis that artifact kinds really exist. In her book *The Metaphysics of Everyday Life* (2007), she presents the following list of criteria for entities to be what she calls “genuine substances”—or entities that are “irreducibly real” (Baker 2007, p. 60). She considers the following conditions:

- “(1) Fs are genuine substances only if Fs have an internal principle of activity;
- (2) Fs are genuine substances only if there are laws that apply to Fs as such, or there could be a science of Fs;
- (3) Fs are genuine substances only if whether something is an F is not determined merely by an entity’s satisfying some description;
- (4) Fs are genuine substances only if Fs have an underlying intrinsic essence;
- (5) Fs are genuine substances only if the identity and persistence of Fs are independent of any intentional activity.” (Baker 2007, p. 60)

These are “five possible ways of distinguishing between natural objects and artifacts, all of which are mentioned or alluded to by David Wiggins” (Baker 2007, p. 60). She argues that “On none of these, [...], do natural objects, but not artifacts, turn out to be genuine substances” (Baker 2007, p. 60). For Baker “What generally underlies the claim that artifacts are not genuine substances, [...], is an assumption that Fs are genuine substances only if conditions of membership in the substance-kind are set by nature, and not by us.” (Baker 2007, p. 63). But—Baker observes—it is tendentious to claim that the existence of artifacts depends not on nature, but on us. The existence of artifacts depends on us, but—she observes—we are part of the nature: “It would be true to say that the existence of artifacts depends not on nature-as-if-we-did-not-exist, but on nature-with-us-in-it. Since nature has us in it, this distinction is no satisfactory basis for ontological inferiority of artifacts.” (Baker 2007, p. 63).

Another realistic position on artifact kinds has been proposed by E. Elder in (2004). He introduces a naturalistically inclined ontology that includes many common sense objects, such as persons, organisms, and some (kinds of) artifacts. For Elder, artifact

kinds are like natural kinds in being the result of a copying process. This process—a cultural copying process—ensures the repeated cohesiveness of specific sets of features. Moreover, this process is considered as an extension of the process resulting in natural kinds, specifically in biological kinds. In this way, human intentions (designers/creators and users' intentions) are reduced to a part of a process of (cultural) copying, and they represent therefore no reason to consider artifact kinds as non-real kinds. With Elder words: “What is written in the title of this chapter is ‘artifacts’. What is written in the book of nature is *copied kinds*” (Elder 2007, p. 51).

Whether or not one takes artifact kinds as real kinds, it is common considering at least some of them as functional kinds. Take, for example, cognitive artifacts: human-made, physical objects that functionally contribute to performing a cognitive task. Richard Heersmink in his “A Taxonomy of Cognitive Artifacts: Function, Information, and Categories” (this issue) argues that cognitive artifacts are instances of functional kinds because they are defined by their function. He then goes on developing a set of related subcategories in which cognitive artifacts with similar properties can be grouped.

If Heersmink is concerned with cognitive artifacts, C. Roversi, L. Tummolini and A. M. Borghi in “A Marriage is an Artefact and not a Walk that We Take Together: An Experimental Study on the Categorization of Artefacts” (this issue) are interested instead in institutional artifacts, i.e. artifacts that are able to fulfill their function not thanks to physical properties like standard artifacts, but rather because of a system of rules. The experiment they build is meant to show how institutional artifacts are “typically opposed to social objects, while being more similar to standard artifacts, be they abstract or concrete.”

6 Answers to (E): Artifacts and Cognitive Sciences

Much of Cognitive Sciences' research on artifact categorization could be thought as addressing what we have called the epistemic question (E):

(E) How can we know that artifact a belongs to kind K ?

Probably, however, cognitive scientists would prefer rephrasing (E) in the following way:

(E1) How do we judge that a certain object a belongs to some category C ?

For instance, how do we judge that a certain round, colored and bouncy object is a ball, or that a tubular plastic object with ink inside is a pen? And how do we decide—to exploit the chair example once more—that a straw-bottomed chair, a rocking chair, a saddle chair and perhaps also an electric chair may all be grouped together? (An introductory book on the topic is Margolis and Laurence 2007).

The reasons why there is no perfect match between (E) and the kind of questions cognitive scientists deal with (such as (E1)) are mainly the following.

First, cognitive scientists prefer to talk about categories or concepts instead of kinds. While kinds, provided they exist, are “out there” in the world, categories and concepts are “in the head” and work as psychological representations of groupings of objects. In other words, while the notion of kind is metaphysical (hence philosophical), the notions

of category and concept are psychological, and these notions can be considered as independent one from another: thus, for instance, my concept or category *chair* may or may not coincide with the metaphysical kind *chair*. Secondly, and given such distinction between categories and kinds, cognitive scientists phrase their questions more naturally in terms of categorization, or judgements, or classification of artifacts than in terms of knowledge. In any case, since we do not wish, in this section, to commit ourselves either to the metaphysical view that kinds exist, or to the psychological view that it only makes sense to talk about categories, in what follows we will use the terms “kind” and “category” as interchangeable.

Cognitive scientists address the question about how we judge that certain objects belong to specific artifact kinds by trying to understand what kind of information, if any, we mainly rely on to make these judgements. Several candidates in this sense have been considered and tested through experimental studies, like for instance (the list is not exhaustive):

- *Form*. This is the hypothesis that an object *o* is judged to belong to the artifact kind *K* if it possesses the perceptual features belonging to *K*: physical structure, dimensions, colors, materials, etc. According to this hypothesis, for instance, an object *o* will belong to the kind *chair* if it has at least some structure (if it is composed out of parts like a seat, a back, and so on).
- *Designers’/Creators’ intended function*. This is the hypothesis that an object *o* is judged to belong to the artifact kind *K* if *o* has the same function originally intended as that of *Ks*. According to such hypothesis, for instance, *o* will be categorized as belonging to the kind *clock* if it has been construed for having the same function the inventor of clocks has originally assigned to it, i.e. the function of measuring time.
- *Use or actual function*. This is the hypothesis that an object *o* is judged to belong to kind *K* if its current function is that of *Ks*. If this hypothesis were correct we would have, for instance, that an object originally created as a bird house, but currently used as a doll house, will be categorized as belonging to the kind *doll house* (or *toy*, depending on the level of function which is taken to be relevant).
- *Originally intended category membership*. This is the hypothesis that an object *o* belongs to kind *K* if *o* has been originally created with the intention of it being a *K*. In the example above, the bird house will be categorized as such even if it is currently used as a doll house, because the object was originally intended to be a member of the kind *bird house*.
- Some *combination* of the previous properties. For instance, an object *o* will be categorized as a *K* if it has both the form and the intended function of *Ks*.

Experiments that test these hypotheses are usually designed to compare the reciprocal weight of two or more dimensions of categorization of artifacts. Thus, some experiments weigh form over actual function (for instance, Gentner 1978; Kemler Nelson et al. 2000; Malt and Johnson 1992; Rips 1989); others compare actual function with intended function (e.g. Keil 1989; Matan and Carey 2001); others still measure the relevance of intended category membership with respect to actual function and form (e.g. Barsalou et al. 2004; Chaigneau 2002).

Experimental results, however, appear to be discouragingly conflicting. Each hypothesis mentioned above seems to be somehow confirmed by some experiments,

rejected by others, neither confirmed nor disconfirmed by others still. Thus, we have no clear indication yet as to which artifacts' features we mostly rely on for categorizing them.

The case of form will serve well to illustrate such situation. *Prima facie*, form may be thought to be less plausible a candidate for guiding categorization of artifacts than other properties—given the variety of shapes, structures, sizes and materials in which one and the same artifact may come, the hypothesis that we categorize artifacts solely (or at least mainly) on the basis of their perceptual qualities seems quite unlikely. However, it seems to be supported by some experiments: for instance, Gentner (1978) finds that both young children and adults, when presented with novel artifacts, prefer to assign them a name on the basis of their form, and not on the basis of their function. Other experiments, instead, did not give results that straightforwardly allowed either to prove or to falsify the hypothesis: for instance, Malt and Johnson (1992) conclude that *in some cases* people categorize artifacts on the basis of their function, *in other cases* on the basis of their form.

Ahn (1998) proposes to explain the conflict of these results by making appeal to the notion of causal role: categorization would then rely on those properties of the object that have a causal role with respect to its other properties. Thus, the fact that some objects are categorized on the basis of their form, and others on the basis of their function would depend on which property is thought to have causal relevance with respect to the other(s). The hypothesis that has to be added to the ones listed above is therefore that an object *o* belongs to kind *K* if it shares with *Ks* the causal relevance of some of its properties (e.g. form) with respect to the other properties (e.g. intended function). Also Ahn's results (1998), however, have been questioned (see for instance Sloman et al. 1998, and Rehder and Hastie 2001).

The reason for such questioning could also lie in lack of clarity as far as the relation between causal reasoning and attributions of properties to artifacts is concerned. In “The Proper Function of Artifacts: Intentions, Conventions and Causal Inferences”, S. E. Chaigneau and G. Puebla (this issue) test the role causal reasoning has in the assignment of the perceived real function to artifacts. There seem to be two main hypotheses about this role: according to the first, people reason causally about artifacts' functional outcomes starting from designers' intentions about functions. According to the second, people use knowledge of designers' intentions to attribute functions, but in doing that they make appeal e.g. to the notion of authority, rather than to causal reasoning. Authors' experimental results seem to support the idea that designer's intentions do not work as causes in the inferential reasoning about artifacts' functions.

In principle, each of the above mentioned hypotheses could be thought as a possible candidate for the role of artifacts' essence in the general view known as “psychological essentialism”. As its name suggests, psychological essentialism (in this case) about kinds is a view about how people commonly reason and think about kinds, not a view about the nature of kinds: it holds that people beliefs in essences is what guide their categorization of objects and substances.

A paradigmatic example of an essentialist view is given by Paul Bloom in a series of works (1996, 1998, 2007; see also Bloom and Markson 1998; Gelman and Bloom 2000; Diesendruck et al. 2003; Levinson 1979, 1989, 1993). Bloom argues in favour of an intentional-historical account of artifacts categorization, i.e. in favour of the

hypothesis that we categorize artifacts on the basis of the designer's/creator's intentions. More precisely, he claims that we judge that a certain object, say a , belongs to artifact kind X , if we judge that a has been “successfully created with the intention that [it] belong[s] to the same kind as current and previous X s” (Bloom 1996, p. 10), or, equivalently, if we judge that “its current appearance and potential use are best explained as resulting from the intention to create a member of artifact kind X ” (Bloom 1996, p. 12). Thus, for instance, we categorize an object as a chair if we judge that its structure and potential use are best explained as resulting from the intention to create a member of the artifact kind chair, i.e. if we judge that it was successfully created with the intention that it be a chair. Moreover, Bloom's intentional-historical account, as anticipated above, is essentialist in nature. That is, Bloom maintains that the designer's/creator's intended category membership constitutes a psychologically real essence for artifacts: it is because we take the designer's/creator's intentions (and how they relate to the form of the object) to be the essence of, say, a chair, that we judge it be a member of the artifact kind chair.

In her “Artifacts and essentialism” (this issue), S. Gelman argues for an original version of essentialism. By focussing on individual artifacts, rather than on artifactual kinds, she claims that attention to authenticity and ownership features guide an essentialist kind of reasoning about artifacts. In particular, she suggests that there are some root capacities underlying essentialism, i.e.: (1) tracking identity over time; (2) being able to distinguish between appearance and reality; (3) the tendency to make novel inductive inferences on the basis of shared similarities (4) causal determinism and (5) deference to experts.

In contrast, and as anticipated above, Malt and Sloman in (2007b)—an extensive critical survey of the different types of tests used by cognitive scientists to study artifact categorization and of the ensuing collection of data and results—claim not only that, *pace* Bloom, designer's/creator's intentions cannot be considered as psychological essences, but also that not even current use or function, intended function, form, causal status of features of the object, or a combination of them can. The reasons are the following. First, “categorization” is, they maintain, a term that covers a variety of distinct mental activities such as naming, objects recognition, induction, planning, and problem-solving. Secondly, each of these activities involves different cognitive demands and constraints. Finally, even within a single activity, e.g. naming (linguistic categorization), we categorize artifacts by alternatively relying on the form of the object, or on its intended function, or on its current function etc., depending on the *context* and on the *goals* of (in this case) conversation. The conclusion they draw from these premises are quite radical and place Malt and Sloman's view at the very opposite end with respect to essentialist views. Since, according to them, there is no absolute notion of categorization, and no absolute dimension along which we categorize artifacts, “no coherent account of artifact categorization is possible” (Malt and Sloman 2007b, p. 87): categorization cannot be considered a coherent field of inquiry and the very notions of artifact kinds and concepts, conceived as stable and clearly bounded categories, are not viable notions.

W. Houkes and P. E. Vermaas (this issue) is an interesting attempt to acknowledge Malt and Sloman's instances about the variety of dimensions along which artifacts can be categorized and the context-dependency of such categorization, while allowing for less dramatic conclusions about artifact kinds and categorization in

general. Quite originally, the attempt has an interdisciplinary character, as it brings together studies in cognitive science and recent developments in philosophy of technology. Contrasting their view with essentialism and with super-minimalism (i.e. Malt and Sloman's view), they argue for "pluralism" about artifact categorization. According to this view, there are only "a *limited number* of possible principles and resulting clusterings of artefacts", and each clustering can be taken to correspond to a psychologically real artifact category.

Dennett's three stances are generally considered as a prerequisite for answering to (E); on Dennett and the discussion on artifacts and design stance see Vermaas et al. (2013).

Consider any entity whose behavior you are interested in to predict, where such prediction counts as an answer to (E). Such an entity could be represented as a simple object, as for example a rock or a spoon, or as a very complex entity, as a suricat or a smartphone. For Dennett, in order to predict the behavior of these entities we can adopt three stances: a *physical stance*, a *design stance* and an *intentional stance*.

In the first stance, the *physical stance*, "our predictions are based on the actual physical state of the particular [entity], and are worked out by applying whatever knowledge we have of the laws of nature" (Dennett 1978, p. 4). With *design stance* we predict the behavior of an entity by making appeal to the assumption that it is a designed entity. For Dennett, this assumption of design means that the entity can be broken up in parts that have specific functions, where a function is a "purpose-relative or teleological" notion. Paraphrasing Dennett, if one knows exactly the functions of each part of a radio, one can give a design-stance prediction of how the radio behaves when assuming that each part functions properly (Dennett 1978, p. 4). Finally, in the *intentional stance* we predict what an entity will do by making appeal to the assumption that it is a rational agent with certain overarching goals and certain perceptual and behavioral capacities.

In recent years, philosophers who study artifacts, specifically in connection with cognitive psychology, criticized Dennett's design stance. H. MacIntyre in his "Category Cognition and Dennett's design stance" (this issue) argues against those philosophers "in light of both further results and alternate findings the authors acknowledge [...]". He argues that "the design stance still stands in virtue of the conflicting character of these findings" and suggests "shifting the domain of empirical scrutiny".

7 Answers to (S): Artifact Kind Terms and Their Semantics

As anticipated in section 1, much of the debate on the semantics of artifact kind terms focuses on a comparison between the semantic behavior of artifact kind terms and of natural kind terms, i.e. terms like "water", "lemon", "tiger", "homo sapiens". Since Kripke (1980), the received view about the latter is that they are not descriptive terms: natural kind terms are much alike proper names in having a directly referential semantics. Given that, our question:

(S) What kind of reference do artifact kind terms have, if any?

can be taken as a question about whether artifact kind terms are either directly referential expressions, and are therefore semantically similar to natural kind terms, or descriptive expressions (for an introduction to the topic, see Ortega Cano 2013).

In order to understand the dynamic of the discussion, it will be convenient to recapitulate the contrast between descriptivism and direct referentialism as regards natural kind terms. A simple⁴ descriptivist theory of natural kind terms would hold that each natural kind term is associated, in the mind of competent speakers, with a definite description that plays two different roles: it gives the meaning of the term and determines its referent. Thus, for instance, if “the clear, colorless, odorless, tasteless liquid typically found in lakes and rivers” is the description speakers associate with “water”, descriptivism maintains that such description is synonymous with “water” and that it determines its referent—that is, it isolates, among all natural kinds, the natural kind “water” refers to.

A directly referential theory of natural kind terms denies both descriptivist claims: it holds that definite descriptions neither give the meaning of a natural kind term, nor determine the term’s referent.

Kripke (1980) famously refuted the claim that definite descriptions are synonym with natural kind terms through the epistemological argument and the modal argument. The two arguments have basically the same structure: the epistemological argument argues that the descriptivist claim has the unwanted consequence of rendering a priori true statements like “Gold is the precious, yellow metal typically used for wedding rings” which instead, if true, are a posteriori true. The modal argument argues that the descriptivist claim has the unwanted consequence of considering as necessarily true statements like the one just mentioned about gold, which instead, if true, are only contingently true.

Against the descriptivist claim that associated definite descriptions determine the referent of the natural kind term, Kripke put forth a semantic argument instead. The argument can be ideally divided in an *argument from error* and an *argument from ignorance*.

On the one hand, people may be in error about the descriptions associated with the natural kind term: still, Kripke maintains, the term succeeds to refer (argument from error). Thus, suppose that the description associated with “gold” includes “is yellow”, and that it turns out that gold is not really yellow, but blue. If, as the descriptivist claims, it is true that the description associated with “gold” determines the referent of “gold”, in the case at hand “gold” would fail to refer (there is no gold). But this is absurd: we would rather say that “gold” still refers to gold (it is just that gold is not yellow as we thought it to be). Hence the associated description does not determine the reference of “gold”.

On the other hand, people may be completely ignorant about the descriptions associated with the natural kind term: still, Kripke says, the term manages to refer (*argument from ignorance*). A nice version of the argument from ignorance is offered in Putnam (1975), and runs as follows. Many of us do not distinguish between an elm and a beech: that is, many of us do not associate with “elm” and “beech” any uniquely identifying description. If, as the descriptivist claims, it is true that the description associated with “elm” determines the referent of “elm”, and that the description associated with “beech” determines the referent of “beech”, “elm” and “beech” in the

⁴ For reasons of space and easiness of exposition, we will not consider here the more elaborate version of descriptivism, i.e. the cluster theory (see Wittgenstein 1953; Searle 1958; Strawson 1959). As it is well known, Kripke’s arguments against descriptivism apply to cluster theory as well.

mouth of ignorant speakers fail to refer to elms and beeches. But this is absurd: even if they are not able to distinguish an elm from a beech, when ignorant speakers use the terms “elm” and “beech”, they are talking about elms and beeches. If this is so, the associated descriptions do not determine the reference of “elm” and “beech”.

Indeed, Putnam (1975) also offers the Twin Earth mental experiment, that can be considered as another, more radical version of the argument from ignorance. This time Putnam asks us to imagine that Earth and Twin Earth, with the exception of the different chemical composition of water—H₂O for water on Earth, XYZ for water on Twin Earth—are perfectly identical planets. In particular, water on Earth and water on Twin Earth serve exactly the same purposes and have exactly the same phenomenal properties. Moreover, Oscar and Twin Oscar are perfect duplicates, with perfectly identical mental states. If this is how things are, it is plausible to think that before 1750 (the year of the discovering of the chemical composition of water in both planets), Oscar and Twin Oscar were in the same cognitive states when understanding the word “water”: for instance, they associated to the word “water” exactly the same definite descriptions. In spite of this, even before 1750 “water” in English and “water” in Twin English had different referents: H₂O and XYZ.

A direct referential theory for natural kind terms thus argues (that natural kind terms are not synonym with definite descriptions associated to them and) that the reference of a natural kind term is not determined by any definite description. But if this latter claim is true, how does the term acquire and conserve reference then? This is when Kripke’s Causal Picture of Reference comes in: according to him, the term refers because of a causal chain of intentions to co-refer that is anchored in an initial naming ceremony. After baptism, that can happen either by ostension or by some reference-fixing description (like “Gold is the substance that all or almost all of these items (the ones in the baptismal sample) instantiate”), the ability to use say “gold” to refer to gold is transferred from one speaker to another by way of a chain of intentions to co-refer. The crucial point is that the Causal Picture is compatible with both *ignorance* and *error*: it is perfectly possible that at some point of the chain a speaker is not able to associate any definite description to the term she is using (think to the case of “elm” and “beech” for instance).

Putnam has been the first to defend the idea that natural kind terms and artifact kind terms are semantically on a par. In *The Meaning of ‘Meaning’*⁵ he writes that something like a directly referential account can be applied both to terms like “water” and to terms like “pencil”, in that stretching Kripke’s theory far beyond the set of terms it was originally meant to apply to. To support his view, Putnam puts forth something like an argument from error for pencils. This time he asks us to consider the epistemic possibility that pencils turn out to be organisms. In that case, he maintains, we would not say that what has been discovered is that there are no pencils; rather, we would say that pencils are different from what we took them to be. Hence, Putnam concludes, it is the nature of pencils that determines the extension of “pencils”, and not some description speakers may associate with the word, e.g. “the artifact made of wood and graphite people use to write with”.

Kornblith takes side with Putnam in maintaining that the directly referential theory can be extended to artifact kind terms:

⁵ Putnam (1975).

“[...] The very arguments which support the new theory of reference in the case of reference to individuals and natural kinds work equally well for the case of reference to artifacts. While there are, beyond doubt, important metaphysical differences between artifacts and natural kinds, the mechanisms of reference are insensitive to these differences. A single theory of reference works equally well for individuals, natural kinds, and artifactual kinds.” (Kornblith 2007, p. 141)

We will come back in a moment to the metaphysical (and also to the epistemological) differences between natural and artifactual kinds. For now, let us just briefly consider a couple of arguments Kornblith supports his view with. The first one parallels the argument from ignorance about “elm” and “beech”. Thus, Kornblith invites us to consider artifact kind terms like “rheostat”, “spandrel”, “Chippendale furniture”: if, as the descriptivist claims, it is true that the description associated with, say, “rheostat” determines the referent of “rheostat”, then “rheostat” in the mouth of ignorant speakers fails to refer to rheostats. But this is absurd: when ignorant speakers use the term “rheostat” they are talking about rheostats. If this is so, the associated description does not determine the reference of “rheostat”.

The second argument was put forth in Kornblith (1980), and can be seen as a version of the argument from ignorance stronger than the previous one. Kornblith thus imagines a Martian anthropologist that lands on Earth and finds what is in fact a doorstep. The Martian knows absolutely nothing about doorstops. If, in such situation, the Martian said something like “Let us call ‘glug’ the kind this object belongs to”, according to Kornblith nothing could count against saying that the Martian succeeded in referring to doorstops. Every time the Martian uses the word “doorstop”, he manages to refer to doorstops even if he is not able to associate any definite description to these objects: all the work of securing reference to the word is done by the (ostensive) baptism.

Unfortunately, all the arguments presented so far are not devoid of problems. For instance, Putnam’s argument about pencils does not prove what Putnam would like it to prove. This is quite effectively shown in Schwartz (1978): all Putnam’s argument manages to prove is either that “pencil” is directly referential, or that the description associated with it does not contain the specification “is an artifact”. If the description associated with “pencil”, in fact, does not comprise such specification, we have no (counterfactual) means to discriminate directly referential uses of “pencil” from descriptive uses of the same word. Kornblith’s argument about words like “rheostat” can be thought instead not to be completely similar to the “elm” and “beech” case. In this latter, it is nature that ultimately discriminates between elm and beeches, and this nature can very well be completely ignored by everyone on Earth. In the case of rheostats, instead, there will always be someone who knows what a rheostat is (rheostats makers, for instance).

This last consideration on nature gives us the chance to highlight where the core of the debate on artifact terms semantics probably lies. There are, in fact, much deeper problems than those related e.g. to the way Putnam specifically concocts the pencils argument. To see this, consider how artifact kinds seem to differ from natural kinds.⁶ First, they differ metaphysically: while natural kinds’ nature is mind-independent, artifact kinds’ nature (if any) is not (Thomasson 2003). Secondly, and not independently

⁶ For a much more nuanced analysis of the differences between natural and artifactual kinds, see for instance Grandy (2007).

from their metaphysical difference, they differ epistemologically: while the nature of natural kinds may be discovered empirically, it does not seem that the nature (if any) of artifact kinds can be so discovered (Thomasson 2003; Schwartz 1978). After all, we make artifacts. But the fact that the nature of a natural kind may be discovered empirically, as something hidden and underlying all samples of that natural kind, is precisely what allows for both ignorance and error regarding such nature. Scientists, for example, may be in error or even utterly ignorant regarding the chemical composition of a certain natural substance. But the same cannot happen, *prima facie* at least, with artifacts. As Schwartz puts it:

“If “pencil” were [directly referential] then it would also be the case that the term could be extended to things that did not superficially resemble the paradigm pencils, so long as they had the same nature or underlying trait. If water is H₂O then any stuff that is H₂O is water regardless of whether or not it superficially resembles the paradigm water. In this sense of “nature” we do not have the remotest idea of what the nature of pencils is.” (Schwartz 1978, p. 571)

That is, there seems to be nothing hidden about artifacts that can play the role of an essence, in the same manner e.g. the chemical composition of water is the essence of water. But if this is so, there seems to be no room for something like substantial error or complete ignorance about artifacts and the very possibility of a semantic argument against descriptivism for artifact terms runs the risk to be undermined (see, on these issues, also Devitt 2005 and Nelson 1982).

For these reasons, in a series of works Schwartz has indeed argued in favour of a descriptive theory for artifact terms (Schwartz 1978, 1980, 1983). Schwartz thinks that artifact kinds are nominal kinds:

“[...] there is no such underlying nature of pencils, nor is there a presumption of such a nature. What makes something a pencil are superficial characteristics such as a certain form and function. There is nothing underlying about these features.” (Schwartz 1978, p. 571)

The essence (if any) of an artifact kind like that of pencils is completely dissimilar from that of a natural kind: if it is given at all, it is purely linguistic, composed out of superficial features of the objects like form and function. The most prominent problem for Schwartz' view is that he endorses a thoroughly descriptivist theory for artifact terms. That is, he not only endorses the thesis that associated descriptions determine the reference of an artifact kind term; he also endorses the thesis that artifact terms are synonymous with such definite descriptions. In fact, the above mentioned quote continues this way:

“[These superficial features] are analytically associated with the term “pencil” (Schwartz 1978, p. 571)

It is not at all clear, however, that such a view on the meaning of artifact terms can stand up to (some adequate version of) the epistemological or modal Kripkean arguments (for a critic of Schwartz' view, see also Putman 1982).

Thomasson (2007) lies somewhat in between Schwartz' descriptivism and Putnam-Kornblith's direct referentialism. Thomasson agrees with the directly referential theory in saying that artifact kind terms are not synonyms of the descriptions speakers associate

with them (thus avoiding the problems Schwartz instead has to face). Moreover, she also agrees with Putnam and Kornblith in maintaining that speakers can be either in error or ignorant about the associated descriptions (and still, the artifact kind term manages to refer). For instance, she would be happy to accept that many of us cannot associate to “rheostats” any uniquely identifying description. However, she disagrees with the directly referential theory in the following points. First, since, in her view, the nature of an artifact lies in the intentions of its maker (see also section 3 above):

“[...] The metaphysical natures of artifactual kinds are *constituted by* the concepts and intentions of makers, a feature that sets them crucially apart from natural kinds.” (Thomasson 2007, p. 53)

she maintains that the makers of the artifact, *qua* makers, are epistemically privileged in a way scientists cannot be. They are immune from ignorance and error with respect to the artifacts they create. As noticed above, if true, this much would suffice to block the possibility to concoct arguments from (substantial) error and ignorance for artifact terms that parallel e.g. the Twin Earth mental experiment for natural terms.

Secondly, and coherently with what said so far, she disagrees with the directly referential theory in holding that it is just because (at least) the maker knows the essence of the artifact she makes, that an artifact kind term can be secured a reference. In her words:

“[...] there can be no reference to artifactual kinds without someone having a relevant concept that in turn plays a role in determining the term’s extension.” (Thomasson 2007, p. 53)

According to Thomasson, then, descriptivism as regards artifact terms holds at least in this: the reference of an artifact kind term is determined by the uniquely identifying description the maker associates to the artifact she creates.

D. Marconi in “Pencils have a point: Against general externalism about artifactual words” (this issue) offers an original approach to semantic issues about artifact categorization. Giving new life to Schwartz’ view, Marconi argues against a thoroughly directly referential semantics for these terms (or, as he phrases the problem, against a thoroughly externalist semantics for them). One of the main arguments in support of his thesis relies on Schwartz’ notion of the persistence of descriptions (see e.g. Schwartz 1980) in our application of words for artifacts. For instance, he claims, if we were to find that chairs are in fact holograms created by aliens, we would then start producing genuine chairs, and we would call them “chairs” just because only at that very moment would we have objects fitting the description. The novelty of Marconi’s approach, however, lies most of all in his arguing in favour of a distinction, among words for artifacts, between words that conform to the descriptivist theory (e.g. “screwdriver”), words that conform to the directly referential theory (e.g. “Aspirin”) and words, finally, that are better treated as “family names” in Wittgenstein’s sense (e.g. “chair”; see above on family resemblance).

8 Conclusions

The topic of artifact categorization has recently attracted the attention of both philosophers and psychologists. However, so far these two communities have carried out their studies in a rather independent way. On the one hand, philosophers have been

more interested either on issues of metaphysical respectability of (any classification of) artifact kinds or on the semantics of artifact kind terms. Hence they have been more interested in answering (O) and (S) kind of questions. On the other hand, psychologists mainly focused on the kind of information that is most important for us to decide what artifact category a given object belongs to, hence on question (E).

Our aim in this paper was to give a survey as much complete as possible of trends and problems in artifact categorization, and to show where interesting overlapping nodes between Metaphysics, Cognitive Sciences and Semantics possibly lie. Finding these overlapping nodes has been the aim of this special issue too.

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